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**Performance Evaluation of the J79 Turbojet Engine & Design
and Construction of Small Turbojet for Performance
Determination.**

Project submitted to the department of mechanical engineering for
B.SC. in mechanical engineering

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Abstract

At present time, commercial and military air transportation play substantial role in world economic activities and defence needs, in away that societies rely heavily on the benefits associated with aviation. The social and economic progress of a country, therefore, depends on the developments of air aviation.

The turbojet and turbofan engines are widely used as power plants for aircraft propulsion because of its merits over other engines. The J79-5C turbojet propelling the F-4 military aircraft is taken as the subject of the project.

It is realized that main industrial gas turbines in the market are derivatives from aero-gas turbine engines counter parts that depended heavily on their research and development programs. Hence the analysis introduced here may be curtailed for industrial gas turbines.

Ideal and real design point analysis are carried out to related engine performance parameters (thrust and thrust specific fuel consumption, TSFC), to design choices (compressor pressure ratio), and design limitation (maximum turbine inlet temperature) and to flight condition (flight speed and altitude). In this context, components figures of merits for adequate level of technology have been introduced and a comparison is made between the manufacturer's performance values and engine design parameters resulting from the present analysis, at sea level static condition. Results of the analysis show that the predicted thrust and TSFC correlated well with the reported values.

The performance of the engine, that is created mathematically, is evaluated under different flight conditions of speed and altitude and different throttle settings based on reference design conditions values obtained at sea level static.

An experimental small turbojet engine is designed, constructed and built for actual matching between gas generator and propulsion nozzle. The basic required systems for engine operation and measurement of its performance are the fuel system, combustion system, ignition system, lubrication system, measurements and control system. In this context, the fuel system is analysed

for safety and accuracy and choked nozzle meter is selected to meter the propane fuel. The nozzles are sized and calibrated using American Standard orifice meters in an experimental rig designed and constructed in the fluid mechanics laboratory. The rotodynamic machines are selected to be a turbo charger of diesel engine with known compressor and turbine performance. The gas turbine combustion chamber is designed and built from stainless steel 304 for corrosion resistance at high temperature.

